Orion: Target diagnostic

Hard X-ray Spectrometer (HXRS)

The Orion laser facility at AWE Aldermaston, one of the largest scientific capital investments in the UK, houses a large neodymium glass laser system and a target chamber in which the high energy density physics experiments are performed. This is necessary to support certification of performance and safety of the UK deterrent.

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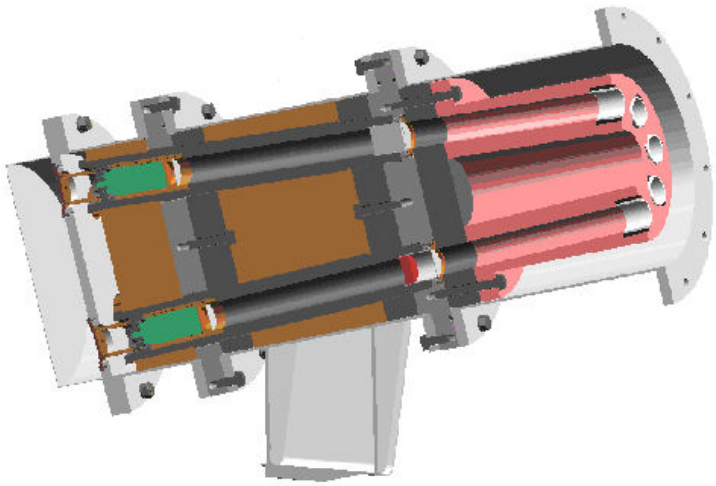
The Hard X-ray Spectrometer (HXRS) has an array of filtered detectors that provide a time integrated measurement of the hard X-ray spectrum relevant to ultra high intensity interactions, and includes time resolution for discriminating against background signals. The spectrometer includes remote control of essential features such as high voltage bias supplies and is designed to survive in the radiation environment generated by short-pulse laser-plasma interactions. The HXRS provides an absolute, time-integrated measurement of the hard X-ray spectrum.



Specification

Number of channels:	8
Spectral range:	100 keV – ~2 MeV

The purpose of the Orion Hard X-ray Spectrometer (HXRS) is to derive the hot electron temperature by measuring the hard X-ray radiation (100 keV - ~2 MeV) produced by laser-irradiated targets. In order to detect the hard X-ray spectrum, each HXRS channel detector consists of a filter, scintillator and a Photomultiplier Tube (PMT). The spectral response of a given channel is determined by the choice and thickness of the filter and the scintillator, in addition to the hard X-ray spectrum intensity. X-rays transmitted by the filters are absorbed by a scintillator material that converts X-rays into visible photons. The scintillator absorption determines the HXRS channel cut-off at high X-ray energies. Conversion of the weak light output of a scintillation pulse into an electrical signal is achieved using photomultiplier tubes.

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